

Commentary of John Leffler, PE

About CPSC docket CPSC-2024-0045 and a proposed study, the CPSC asks the following question:

*“Whether the proposed collection of information is necessary for the proper performance of CPSC’s functions, including whether the information will have practical utility.”*

The information gained from the study will not have the “*practical utility*” it appears to seek. The Federal Register posting includes the following language:

**“Summary of the Collection of Information:** *The objective of this study is to conduct human slip research on three bathtubs on the market and to measure the friction demand of participants stepping into and out of the bathtubs when dry and wet. CPSC contracted with Arizona State University (ASU) to conduct this study. Participants will be recruited from the Phoenix, Arizona metro area. The experiments will be conducted at ASU’s Locomotion Research Laboratory. The study will involve a total of three sessions to test three bathtub surfaces, where participants will walk into the tub and step out, while wearing fall arresting harness systems for safety. During these sessions, resistance forces under the foot and motion of the foot movements will be measured. The study will quantify the minimum frictional performance required for a bathing surface to reduce slips and falls. CPSC staff will share the results of the study with the ASTM F15.03 Committee on Safety Standards for Bathtub and Shower Structure working on replacing ASTM F462.”*

- A. Of this section, **Sentence 1** states that the objective of the study is to determine the friction demand of humans stepping in and out of three bathtub products. **Sentence 6** reinforces that the study will document friction demand - which is the friction used by a human, calculated from the forces applied by a human to a surface (in this case, a bathtub). **Sentence 7**, in contrast, states that this same study “*will quantify the minimum frictional performance required for a bathing surface...*”, meaning a bathtub product, but in fact the study will NOT quantify this, at least not as outlined in the request for comment. The underfoot forces a human applies in locomotion are a completely different quantification from the friction a bathing surface product has, which can only be quantified by a tribometer - a non-biofidelic machine, a tool. Despite the stated goal (**Sentence 8**) of the ASU research being to support ASTM F15.03 replacement of the withdrawn standard for bathing surface tribometer testing (ASTM F462), as described the study would in fact provide no information useful for replacing F462 or manufacturing bathing surfaces.

The CPSC posting also includes this section:

**“Description of the Need for the Information and Proposed Use of the Information:** *Falls are the leading cause of injury and death for older adults 65 and older. Information collected as part of the bathtub slip resistance study is needed initially to support CPSC staff in efforts to work with the ASTM F15.03 Committee on Safety Standards for Bathtub and Shower Structures to replace the obsolete ASTM F462 standard for bathing surface friction that ASTM withdrew in 2016. This study will be used to inform CPSC staff of major requirements needed to achieve an efficient and effective slip-resistance standard.”*

- B. The ASU friction demand research will be only of academic interest unless the underfoot surfaces identified as slippery (based on human slips of a certain minimum distance and/or

velocity occurring on them) are subsequently tested with a tribometer model and method that accommodates the unique character of bathing surface construction. These tribometric measurements would provide the foundations (as manifested in an F462 replacement) for manufacturers to use the same tribometer model and method in comparing the friction of their products with the minimum benchmarks set in the standard. In turn, the standard and tribometer method could be used for production line quality assurance, and after installation, proactive friction auditing. But none of this would result from only having data about how much force a series of humans apply to a bathing surface.

- C. Manufacturers of porcelain enameled metal bathing surfaces use company-specific, proprietary, and methodologically unique methods for creating the friction features on the floors of their products. The ASU study as described will only use three bathing surface products (which I assume will all be porcelain-enameled metal), with the friction feature technology of only those products. As such, these surfaces cannot inherently serve as a frictional reference for other manufacturers. If a manufacturer is not represented in the cohort of three products, it can be anticipated that they would vote against adoption of any friction thresholds in a proposed ASTM standard.
- D. Another important consideration is that the porcelain enameled metal bathing surface manufacturing industry has never needed to tightly control the friction feature consistency across the floors of their products, and many do not. As was discovered in CPSC project 61320621Q0068, there may be significant differences between the friction in one area of a bathtub floor versus another area. This is why tribometric evaluation of the specific locations of human slips is critical.
- E. In December of 2023 the ASTM F15.03 subgroup tasked with the replacement of ASTM F462 finished months of work in designing a proposed research plan that would nominally address all of these outlined issues – this research plan was shared with CPSC at the F15.03 meeting on December 11, 2023. This research, if funded, would analyze a minimum of six different porcelain enameled metal bathing surface products, and more if available. It would analyze multiple human tests on each of these surfaces and record the position of slips on each sample for follow-up tribometer testing (at that position) utilizing the method refined in CPSC project 61320621Q0068. This method, as an aside, uses the tribometer generally accepted around the world (except in the US), the British Pendulum, which is non-proprietary and available from numerous manufacturers. Friction data from slip locations across 6+ bathing surface products would allow the deriving of a minimum friction threshold more accommodating of the variety of products on the market. This friction threshold and Pendulum method would provide the foundation for replacing ASTM F462.
- F. Of interest is the section stating this proposed “*study is needed initially to support CPSC staff in efforts to work with the ASTM F15.03 Committee on Safety Standards for Bathtub and Shower Structures to replace the obsolete ASTM F462 standard for bathing surface friction that ASTM withdrew in 2016.*” In reality, the study was designed and contracted without the knowledge of (or consultation with) the ASTM F15.03 committee, and the study

as described does not consider the important technical factors incorporated by the F15.03 committee in their December 2023-released research plan, as described in paragraphs B, C, D and E above. Indeed, the F15.03 committee has received no study details beyond those described in this request for comments, in the four months since CPSC revealed their study contract with Arizona State University to F15.03. If the replacement of ASTM F462 is indeed the goal of the CPSC, the three-year ASU study as proposed will serve primarily to delay replacing F462 by three years. As for the statement “*This study will be used to inform CPSC staff of major requirements needed to achieve an efficient and effective slip-resistance standard*”, the study as described will fail to so inform CPSC staff.

- G. Any replacement of ASTM F462 must have the support of the government, via the CPSC. The bathing surface manufacturing industry, the insurance industry, and the hospitality (hotel) industry are the primary entities that deal with bathing surfaces and the liabilities associated with their floor friction. Yet years of inquiry and effort by the F15.03 committee have shown that these industries in general do not view assisting with the replacement of the trivially-easy-to-pass ASTM F462 friction standard as necessarily beneficial to their business – for anticipable reasons discussed with the CPSC multiple times – and to date, these industries have not been willing to discuss funding the needed research. Private funding, for example by universities or forensic researchers, would be a risky outlay as there would be no guarantee that the government would put their eventual support behind it; without tangible government backing, the incentives for the bathing surface industry to disturb the status quo and support a new standard would be few. Government funding is needed – and now, preferably, not in three years.
- H. In the Comments posted to date on the regulations.gov webpage, there is a suggestion by the National Floor Safety Institute (NFSI) that NFSI has already done the necessary research, but this is incorrect. The study they cite was published in a journal for standards industry professionals, not one used by friction research scientists. The study did not involve the stepover heights of a bathtub rim or the associated gait dynamics; did not involve sample materials for which any homogeneity analysis was provided; did not involve people slipping, only subjective characterizations of slips, and the study demonstrates that the multiple tribometers NFSI claims as being equivalently able to test to some single friction threshold value indeed get different results when tested on the same surface. This purported but absent “equivalence” of tribometers is one of the factors already identified by CPSC in responding to a recent NFSI petition to have their documents adopted by the government. The NFSI comment also suggests CPSC cite their B101.4 document, which they refer to as a “standard” when it is not; ANSI accreditation of standards developers is what results in “standards” in the US, and NFSI is not ANSI accredited. The B101.4 document uses NFSI’s flawed research study as a foundation for barefoot friction threshold levels, but B101.4 had no “committee” participation by bathing surface industry personnel, and its statistically-undocumented methods would be unable to reliably evaluate the friction of most plastic bathing surfaces (which rely on atypical “three dimensional” friction mechanisms); such products comprise about half of the US market.

Thanks, John Leffler